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EXAMINER	
LEUNG, CHRISTINA Y	

ART UNIT	PAPER NUMBER
2633	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/023,745	KIM ET AL.
	Examiner	Art Unit
	Christina Y. Leung	2633

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 21 December 2001.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-36 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-36 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 07 January 2002 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the channel card in claim 9 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 6-8, and 10-36 are rejected under 35 U.S.C. 102(b) as being anticipated by Russell et al. (US 5,627,879 A).

Regarding claim 1, Russell et al. disclose a communications system (Figures 17, 27A, 27B, 28, and 29), comprising:

a base station (base station 330 shown in Figure 17, connected to a "Head End" element including head end unit 332 and modulator/demodulator element 338 shown in detail in Figures 27B and 28 respectively) configured to output a first digital in phase and quadrature phase (I/Q) signal (such as the quadrature amplitude modulated [QAM] signal output from modulator 460 in Figure 28; column 17; lines 31-36);

an optical connecting unit (AM optical transmitter 462 in Figure 28) configured to convert the first digital I/Q signal into an optical signal and output the converted optical signal through an optical cable 340A (column 17, lines 35-36); and

an optical base station (optical node 342 in Figure 17 and shown in detail in Figure 29) coupled to receive the optical signal through the optical cable 340A and configured to convert the optical signal into a second digital I/Q signal (using AM optical receiver 500 in Figure 29; column 17, lines 43-45), and convert the second digital I/Q signal into a first RF signal for transmission (using QAM demodulator 502 and digital-to-analog converter 504 in Figure 29; column 17, lines 45-53).

Examiner notes that although Russell et al. do not specifically use the term "I/Q signal" in their disclosure, it would be well understood in the art that a quadrature amplitude modulated

signal such as disclosed by Russell et al. is inherently a type of signal that is a digital in phase and quadrature phase (I/Q) signal.

Regarding claim 2, Russell et al. disclose that the optical base station (Figure 29) comprises:

an optical transceiver (including AM optical receiver 500; column 17, lines 43-45) configured to convert the optical signal received through the optical cable into the second digital I/Q signal;

a multiplexer/demultiplexer unit (QAM demodulator 502; column 17, lines 45-48) configured to demultiplex the second digital I/Q signal outputted from the optical transceiver;

an up-converter (mixer 506; column 17, lines 48-51) configured to convert and filter an output signal of the multiplexer/demultiplexer unit and output the first RF signal;

a high power amplifier 510 configured to amplify the first RF signal outputted by the up-converter; and

a duplexer 514 configured to filter the amplified first RF signal and provide the filtered output to an antenna 516 (column 17, lines 51-53).

Regarding claim 6, Russell et al. disclose that the antenna elements in the optical base station (Figure 29) includes a diversity antenna 520 (column 17, lines 57-62).

Regarding claim 7, Russell et al. disclose that the optical connecting unit (Figure 28) comprises:

a multiplexer/demultiplexer (QAM modulator 460; column 17, lines 33-36) configured to multiplex the first digital I/Q signal;

optical transceiver (including AM optical transmitter 462) configured to convert an output signal of the multiplexer/demultiplexer into the optical signal and transmit the optical signal through the optical cable 340A to the optical base station; and

a clock unit configured to provide a synchronous signal to the multiplexer/demultiplexer unit (not explicitly shown, but disclosed in column 31, lines 3-9).

Regarding claim 8, Russell et al. discloses that the optical transceiver (including AM optical receiver 466 in Figure 28) is further configured to receive an optical signal from the optical base station and convert the received optical signal into a third digital I/Q signal to be transmitted to the base station (column 17, lines 36-41).

Regarding claim 10, Russell et al. disclose that the optical base station and the optical connecting unit are digital interface-based devices (column 16, lines 65-67; column 1, lines 1-2).

Regarding claim 11, as similarly discussed above with regard to claim 1, Russell et al. disclose a signal transmitting method for a communications system (Figures 17, 27A, 27B, 28, and 29), comprising:

converting a first digital I/Q signal outputted from a base station into an optical signal (using AM optical transmitter 462 in element 338 in Figure 28; column 17, lines 35-36);

transmitting the optical signal through an optical cable 340 A to an optical base station (optical node 342 in Figure 29);

converting the optical signal received through the optical cable into a second digital I/Q signal (using AM optical receiver 500 in optical node 342; column 17, lines 43-45);

converting the second digital I/Q signal into a RF signal (using QAM demodulator 502 and digital-analog converter 504 in optical node 342; column 17, lines 45-53); and

transmitting the RF signal through an antenna 516 (column 17, lines 51-53).

Regarding claim 12, Russell et al. disclose that converting the second digital I/Q signal to a RF signal comprises:

demultiplexing the second digital I/Q signal (using QAM demodulator 502 in Figure 29); column 17, lines 45-48);

converting the demultiplexed signal to an analog signal (using digital-to-analog converter 504);

band pass filtering the analog signal to generate the RF signal (using mixer 506; column 17, lines 48-51);

high-power amplifying the RF signal (using amplifier 510); and

filtering the amplified RF signal (using filter 512; column 17, lines 51-53).

Regarding claim 14, Russell et al. disclose that converting the first digital I/Q signal to the optical signal comprises multiplexing the first digital I/Q signal (using QAM modulator 460 in Figure 28; column 17, lines 33-36).

Regarding claims 13 and 15, Russell et al. disclose that demultiplexing and multiplexing is performed in accordance with a synchronous signal (column 31, lines 43-60).

Regarding claim 16, Russell et al. disclose the antenna comprises a diversity antenna 520 (Figure 29; column 17, lines 57-62).

Regarding claim 17, Russell et al. disclose receiving an RF signal through the antenna (column 17, lines 53-59).

Regarding claim 18, Russell et al. disclose a signal receiving method for a communications system (Figures 17, 27A, 27B, 28, and 29), comprising:

receiving an RF signal through an antenna 516 of a first station (optical node 342 shown in Figure 29; column1 7, lines 53-59);

converting the received RF signal to a first digital electronic signal (using analog-to-digital converter 534 and QAM modulator 536; column 17, lines 59-61) ;

converting the first digital electronic signal to a digital optical signal (using AM optical transmitter 538; column 17, lines 63-65);

transmitting the digital optical signal over an optical link 340B to an optical connecting unit (element 338 in Figure 28; see also Figure 17);

converting the digital optical signal to a second digital electronic signal in the optical coupling unit (using AM optical receiver 466; column 17, lines 36-39); and

providing the second digital electronic signal from the optical coupling unit to a second station (such as base station 30 as shown in Figure 17).

Regarding claim 19, Russell et al. disclose that the optical link 340B comprises an optical cable (column 17, lines 62-65).

Regarding claim 20, Russell et al. discloses that the first station comprises a remote base station (optical node 342) and wherein the second station comprises a base station 330 (Figure 17).

Regarding claim 21, Russell et al. disclose that the antenna comprises a diversity antenna 520 (column 17, lines 57-62).

Regarding claim 22, Russell et al. disclose a communications system (Figures 17, 27A, 27B, 28, and 29), comprising:

means for converting a first digital electronic signal outputted from a first station (base station 330 in Figure 17) into a first digital optical signal (AM optical transmitter 462 in element 338 shown Figure 28; column 17, lines 31-36);

means for transmitting the first digital optical signal to a second station (AM optical transmitter 462 transmits the digital optical signal over fiber 340A to optical node 342);

means for converting the first digital optical signal to a second digital electronic signal (AM optical receiver 500 in optical node 342 shown in Figure 29);

means for converting the second digital electronic signal to a first RF signal (including digital-to-analog converter 504 and mixer 506; column 17, lines 43-51); and

means for transmitting the first RF signal (antenna 516).

Regarding claim 23, Russell et al. disclose that first digital optical signal is transmitted to the second station using an optical cable 340A (column 17, lines 31-36).

Regarding claim 24, Russell et al. disclose means for amplifying and filtering the first RF signal prior to transmitting (amplifier 510 and filter 512 in Figure 29; column 17, lines 51-53).

Regarding claim 25,. Russell et al. disclose means for receiving a second RF signal in the second station (antennas 516 and 520; column 17, lines 53-61);

means for converting the second RF signal to a third digital electronic signal (analog-to-digital 534 and QAM modulator 536; column 17, lines 62-65);

means for converting the third digital electronic signal to a second digital optical signal (AM optical transmitter 538);

means for transmitting the second digital optical signal over the optical link (AM optical transmitter 538);

means for converting the second digital optical signal to a fourth digital electronic signal (AM optical receiver 466 in Figure 28); and

means for providing the fourth digital electronic signal to a second station (the fourth digital electronic signal is provided to a second station such as base station 330 in Figure 17 through QAM demodulator 464 in Figure 28 and elements in Figure 27B).

Regarding claim 26, Russell et al. disclose a signal transmitting method in a communication system (Figures 17, 27A, 27B, 28, and 29), comprising:

converting a digital I/Q signal to an optical signal in an optical connecting unit (using AM optical transmitter 462 in Figure 28);

transferring the optical signal over an optical cable 340A to a remote station (i.e., optical node 342 shown in Figure 29); and

converting the optical signal into an RF signal for transmission (using AM optical receiver 500, QAM demodulator 502, digital-to-analog converter 504, mixer 506, etc. in the optical node as shown in Figure 29).

Regarding claim 27, Russell et al. disclose that the digital I/Q signal is received from a base station 330. Figure 17 shows the connection between base station 300 through head end uni 332, modulator/demodulator 338, and optical node 342.

Regarding claim 28, Russell et al. disclose converting the optical signal comprises:

converting the optical signal into an analog signal and demultiplexing the analog signal (using QAM demodulator 502, and digital-to-analog converter 504; column 45-51);

up converting and filtering the demultiplexed analog signal to generate the RF signal (using mixer 506; column 17, lines 48-51); and

amplifying and filtering the RF signal (using amplifier 510 and filter 512; column 17, lines 51-53).

Regarding claim 29, Russell et al. disclose converting the digital I/Q signal comprises multiplexing the digital I/Q signal (using QAM modulator 460 in Figure 28) and inputting the multiplexed digital I/Q signal into an optical transceiver (AM optical transmitter 462) to generate the optical signal.

Regarding claim 30, Russell et al. disclose receiving an external RF signal through an antenna coupled to the remote station (column 17, lines 53-65);

converting the external RF signal to a second optical signal (using mixer 528, analog-to-digital converter 534, QAM modulator and AM optical transmitter 538 in Figure 29);

transferring the second optical signal to the optical connecting unit (through optical fiber 340B); and

converting the second optical signal to a second digital I/Q signal (using AM optical receiver 466 and QAM demodulator 464 in Figure 28).

Regarding claim 31, Russell et al. disclose a communication system (Figures 17, 27A, 27B, 28, and 29), comprising:

an optical connecting unit ("Head End" element in Figure 17, including QAM modulator 460 and AM optical transmitter 462 shown in Figure 28), configured to receive a first digital I/Q signal and convert the first digital I/Q signal into a first digital optical signal (column 17, lines 31-36); and

a remote base station (optical node 342 in Figure 17, shown in detail in Figure 29), coupled to receive the first digital optical signal and configured to convert the first digital optical signal to a first analog RF signal for transmission (column 17, lines 42-53).

Regarding claim 32, Russell et al. disclose that base station 342 is further configured to receive a second RF analog signal and convert the second analog RF signal to a second digital optical signal (using mixer 528, analog-to-digital converter 534, QAM modulator and AM optical transmitter 538 in Figure 29; column 17, lines 53-65); and

that the optical connecting unit is coupled to receive the second digital optical signal and further configured to convert the second digital optical signal to a second digital I/Q signal for transmission (using AM optical receiver 466 and QAM demodulator 464 shown in Figure 28; column 36-41).

Regarding claim 33, Russell et al. disclose a communication system, comprising:

an optical connection unit ("Head End" element in Figure 17, including elements shown in Figure 28), configured to convert a first digital I/Q signal to a first optical signal and to convert a second optical signal to a second digital I/Q signal (column 17, lines 31-41); and

a remote base station (optical node 342 in Figure 17, shown in detail in Figure 29), coupled to receive the first optical signal, and configured to convert the first optical signal to a third digital I/Q signal, convert the third digital I/Q signal to a first RF signal, transmit the first RF signal, receive a second RF signal, convert the second RF signal to a fourth digital I/Q signal, and convert the fourth digital I/Q signal to the second optical signal (column 17, lines 42-65).

Regarding claim 34, Russell et al. disclose an optical link coupling the optical connecting unit to the remote base station (fibers 340A and 340B) .

Regarding claim 35, Russell et al. disclose that the remote base station comprises a diversity antenna 520 (column 17, lines 57-62).

Regarding claim 36, Russell et al. disclose that the optical connecting unit comprises a multiplexer configured to multiplex the first digital I/Q signal and a demultiplexer configured to demultiplex the second digital I/Q signal (QAM modulator 460 and QAM demodulator 464, respectively, in Figure 28; column 17, lines 31-41), and

that the remote base station comprises a demultiplexer configured to demultiplex the third digital I/Q signal and a multiplexer configured to multiplex the fourth digital I/Q signal (QAM demodulator 502 and QAM modulator 536, respectively, in Figure 29; column 17, lines 42-65).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al. in view of Gordon et al. (US 5,067,173 A).

Regarding claim 3, Russell et al. disclose a system as discussed above with regard to claim 2 and further disclose that the optical base station further comprises:

a plurality of filters 518 and 522 configured to remove a noise component of a second RF signal collected by a corresponding plurality of antennas 516 and 520;

a plurality of down-converter units (mixers 528 and 524 and analog-to-digital converter 534) configured to band-pass filter, down-convert and analog to digital convert, the second RF signals.

Russell et al. explicitly show one duplexer 514 but do not specifically disclose a plurality of duplexers. However, Russell et al. also already disclose that the optical base station may include a plurality of antennas for transmitting and receiving a plurality of channels (Figure 42). It would have been obvious to a person of ordinary skill in the art to provide a plurality of duplexers to correspond to a plurality of antennas in the system disclosed by Russell et al. in order to separate the incoming and outgoing signals from each other and ensure that they are properly processed.

Russell et al. also do not specifically disclose a plurality of amplifiers to amplify the second RF signals. However, Gordon et al. teach a system related to the one disclosed by Russell et al. including receiving RF signals at antennas (Figure 2). Gordon et al. further teach a plurality of amplifiers 204 and 212 configured to amplify RF signals outputted from the antennas. It would have been obvious to a person of ordinary skill in the art to include antennas as taught by Gordon et al. in the system disclosed by Russell et al. in order to ensure that the level of received RF signals is high enough for proper reception and processing.

Regarding claims 4 and 5, Russell et al. discloses that the optical base station further comprises a clock unit configured to provide a synchronous signal to the multiplexer/demultiplexer unit and further comprises a reference clock unit configured to provide the synchronous signal of the clock unit to the up-converter unit and the plurality of down-converter units (column 31, lines 10-18).

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al.

Regarding claim 9, Russell et al. disclose a system as discussed above with regard to claim 1 and further disclose that the optical connecting unit receives the first digital I/Q signal from the base station 303 (shown in detail in Figure 27A), but they do not specifically disclose a channel card. However, channel cards are well known in the art as a widely available hardware implementation of the signal transmitting elements already disclosed by Russell et al. in the case station (Figure 27A shows transmitters 453). It would have been obvious to a person of ordinary skill in the art to specifically use transmitters implemented in channel cards in the base station disclosed by Russell et al. as an engineering design choice of a way to provide the transmitters using available and readily replaceable transmitter hardware.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung whose telephone number is 571-272-3023. The examiner can normally be reached on Monday to Friday, 6:30 to 3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2600.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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